Announcing the Availability of EOS7C Version 1.0:

TOUGH2 Module for Carbon Dioxide or Nitrogen in Natural Gas (Methane) Reservoirs

- **Carbon Sequestration in Natural Gas Reservoirs**
- **Enhanced Gas Recovery**
- **Natural Gas Storage**
- **CO_2 Injection in Methane-Rich Saline Formations**
- **Cushion Gas Replacement**

Overview:

EOS7C is a TOUGH2 module for multicomponent gas mixtures in the systems methane-carbon dioxide (CH_4-CO_2) or methane-nitrogen (CH_4-N_2) with or without an aqueous phase and H_2O vapor. EOS7C uses a cubic equation of state and an accurate solubility formulation along with a multiphase Darcy's Law to model flow and transport of gas and aqueous phase mixtures over a wide range of pressures and temperatures appropriate to subsurface geologic carbon sequestration sites and natural gas reservoirs. EOS7C models supercritical CO_2 and subcritical CO_2 as a non-condensible gas, hence EOS7C does not model the transition to liquid or solid CO_2 conditions. The components modeled in EOS7C are water, brine, non-condensible gas, gas tracer, methane, and optional heat. The non-condensible gas (NCG) can be selected by the user to be CO_2 or N_2. The real gas properties module has options for Peng-Robinson, Redlich-Kwong, or Soave-Redlich-Kwong equations of state to calculate gas mixture density, enthalpy departure, and viscosity. Partitioning of the NCG and CH_4 between the aqueous and gas phases is calculated using a very accurate chemical equilibrium approach. Transport of the gaseous and dissolved components is by advection and Fickian molecular diffusion.

TOUGH2/EOS7C can be ordered from: **http://www-esd.lbl.gov/TOUGHPLUS/software-misc.html#**

Academic and non-commercial: $500 (source code)
Commercial: $2,000 (executable), $5,000 (source code)

(all royalties from TOUGH *software sales are used to further the development, testing, and documentation of the* TOUGH *codes)*

Developers:

Curtis M. Oldenburg, George J. Moridis, Nicolas Spycher, and Karsten Pruess
Earth Sciences Division 90-1116, Lawrence Berkeley National Lab
University of California, Berkeley, CA 94720
Contact: cmoldenburg@lbl.gov

User Guide:

Oldenburg, C.M., G.J. Moridis, N. Spycher, and K. Pruess, EOS7C Version 1.0: TOUGH2 Module for Carbon Dioxide or Nitrogen in Natural Gas (Methane) Reservoirs, Lawrence Berkeley National Laboratory Report LBNL-56589, March 2004.

Peer-reviewed articles based on EOS7C:

Oldenburg, C.M., Joule-Thomson cooling due to CO_2 injection into natural gas reservoirs, *Energy Conversion and Management*, *48*, 1808-1815, 2007, LBNL-60158.

Oldenburg, C.M., S.H. Stevens, and S.M. Benson, Economic feasibility of carbon sequestration with enhanced gas recovery (CSEGR), *Energy*, 29,1413–1422, 2004 LBNL-49762.

Oldenburg, C.M., Carbon dioxide as cushion gas for natural gas storage, *Energy& Fuels*, *17*, 240-246, 2003, LBNL-51053.

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